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(54) Fastening of a runner wheel on the shaft of a pump

(57) Fastening of a runner wheel on the shaft (2) of a pump, particularly of a twin-inlet runner wheel fixed on the shaft by a feather key (3), the runner wheel comprising a hub (11) of hydraulic shape with two end faces, the first end face bearing against a collar (22) of the shaft, the second end face of the hub bearing against a divided ring (4) situated in a circumferential groove of the shaft, over which divided ring a shrunk-on ring (5) is applied at heated conditions. The external surface of the shrunk-on ring corresponds to the hydraulic shape of the hub of the runner wheel.

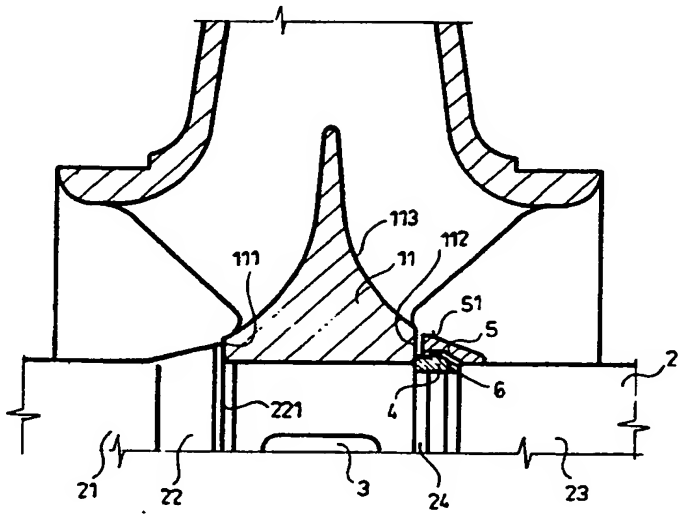

FIG.1

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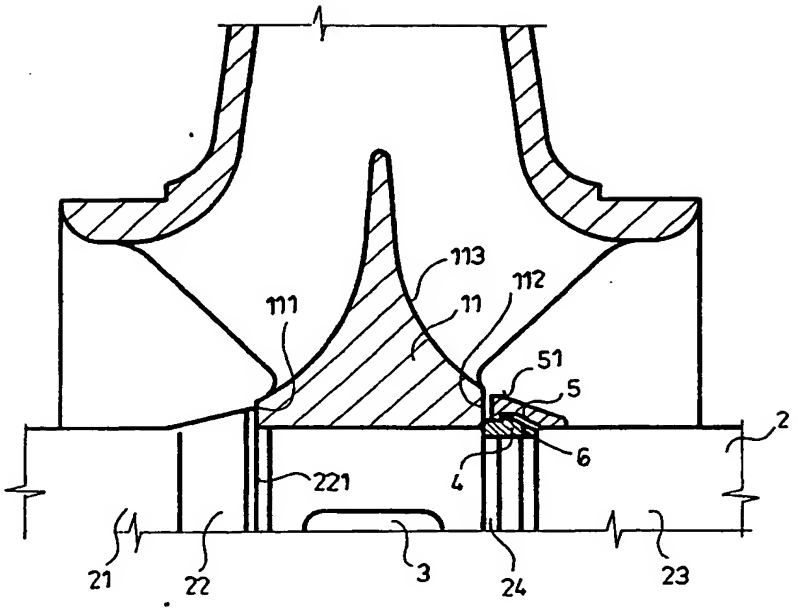

FIG.1

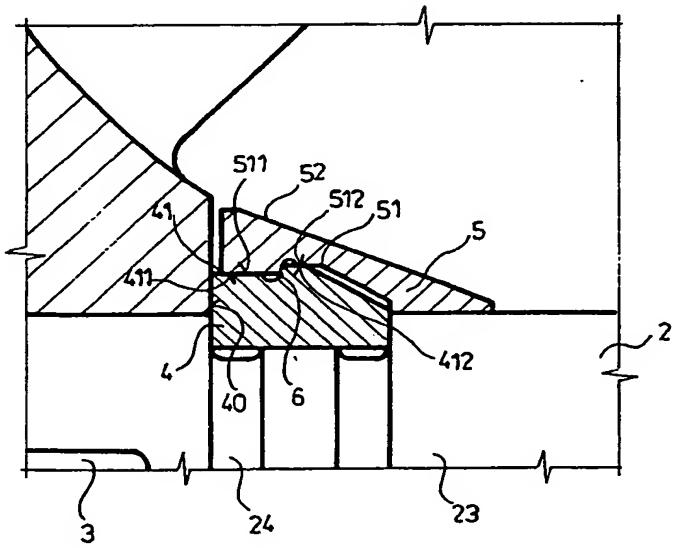

FIG. 2

SPECIFICATION

Fastening of a runner wheel on the shaft of a pump

The invention relates to a fastening of a runner wheel on the shaft of a pump, particularly of a twin-inlet runner wheel.

Twin inlet runner wheels of centrifugal pumps have to be fastened on the shaft so as to secure transmission of the torque from the drive and so as to be able to receive axial forces from both directions. Twin inlet runner wheels are now usually fastened on the shaft of the pump by means of a feather key situated in a longitudinal groove of the shaft, wherein the hub of the runner wheel on the side more distant from the drive rests against a collar of the shaft, on the side of the drive against a spacer ring, axially secured by a nut or the hub of the runner wheel rests at both sides against spacer rings, which are axially secured by nuts. A drawback of this arrangement is that the applied spacer rings are increasing the diameter of the rotor at the inlet into the runner wheel, thus reducing the inlet cross-section of the runner wheel, which adversely influences the output of the pump and its efficiency. Another drawback is that due to tightening of the rotor by nuts with spacer rings a deformation of the rotor takes place, whereby the reliability of operation and the life time of the pump are unfavourably influenced.

Another known fastening of twin inlet runner wheels on a shaft is by means of a pressure connection, securing both the transmission of the torque and receiving also axial forces. A drawback of this, from the point of view of design are high technological requirements on manufacture and assembling and also an increased danger of the occurrance of cracks due to material fatigue.

It is an object of this invention to provide a fastening of twin inlet runner wheels of pumps on the shaft, which needs no screw connection and which does not reduce the inlet cross-section of the runner wheel.

The runner wheel has to be fastened on a shaft according to this invention comprises a hub of hydraulic shape with two end faces which is fixed on the shaft by a feather key situated in a longitudinal groove of the shaft, wherein the first end face of the hub of the runner wheel rests against a radial bearing surface of a collar of the shaft, the second end face of the hub of the runner wheel rests against the face of a divided ring arranged in a circumferential groove of the shaft behind the second end face of the hub of the runner wheel, wherein the divided ring in the circumferential groove of the shaft is fixed by a shrunk-on collar which is applied at elevated temperature on the external surface of the divided ring, the external shape of which shrunk-on collar corresponding to the hydraulic shape of the hub of the runner wheel.

The external surface of the divided ring can consist of two mutually stepped-up surfaces of different diameter, wherein the first circumferential surface at the side of the hub of the runner wheel has a smaller diameter and the second circumferential surface of larger diameter is arranged at the more distant part of the external surface of the divided ring from the hub of the runner wheel.

The internal opening of the shrunk-on collar can consist of two cylindrical parts, the diameter of the first part corresponding to the smaller diameter of the first circumferential part of the external surface of the divided ring and the diameter of the second cylindrical part corresponds to the larger diameter of the second circumferential part of the external surface of the divided ring.

The cylindrical parts of the internal opening of the shrunk-on collar and the circumferential parts of the external surface of the divided ring can provide after assembling a constructional lock.

The higher technical effect of the solution according to this invention consists in an increased reliability in operation due to elimination of the danger of occurrance of cracks of the shaft and due to elimination of screw connections. The higher effect shows also in an increased efficiency of the pump as the inlet cross-section of the runner wheel is not reduced so that losses due to friction are also reduced.

An embodiment of fastening of the twin inlet runner wheel on a shaft of a pump according to this invention will now be described, by way of example, with reference to the accompanying diagrammatic drawing, in which:

Figure 1 is a part of a longitudinal sectional view of a twin inlet runner wheel fixed on a shaft of a pump, and

Figure 2 is a sectional view of a detail of fastening of a twin inlet runner wheel on a shaft of a pump from the side of the not shown drive of the pump.

The twin-inlet runner wheel 1 provided with a hub 11 with two opposite end faces 111, 112 is arranged on a shaft 2 of the pump by means of a feather key 3. The first end face 111 of the hub 11 is situated on the side 21 of the shaft 2 which is remote from the drive not shown and the second end face 112 of the hub 11 is situated on the side 23 of the shaft 2 which is close to the drive. The shaft 2 is provided on the side 21 with a collar 22 with a radial bearing surface 221 and on the side 23 with a circumferential groove 24 behind the second end face 112 of the hub 11. The twin-inlet runner wheel 1 bears with the first end face 111 of the hub 11 against the radial bearing surface 221. A divided ring 4 is situated in the circumferential groove 24 of the shaft 2, against the face 40 of which divided ring 4 rests the second end face 112 of

the hub 11. The external surface 41 of the divided ring 4 is provided with two mutually stepped up circumferential surfaces 411, 412 of different diameter, the first circumferential surface 411 of smaller diameter is closer to the hub 11 of the runner wheel 1 than the second circumferential surface 412 of larger diameter. A shrunk-on ring 5, which has an external shape 52 which merges with the hydraulic shape 113 of the hub 11 of the runner wheel 1, is shifted on the divided ring 4 at heated condition by its internal opening 51. The internal opening 51 of the shrunk-on ring 5 has two cylindrical parts 511, 512, the diameter of the first cylindrical part 511 which is closer to the hub 11 of the runner wheel 1 corresponds to the smaller diameter of the first circumferential surface 411 of the external surface of the divided ring 4 and the diameter of the second cylindrical part 512 corresponds to the larger diameter of the second circumferential surface 412 of the external surface 41 of the divided ring 4. These stepped-up cylindrical parts 511, 512 of the internal opening of the shrunk-on ring 5 and stepped-up circumferential parts 411, 412 of the external surface 41 of the divided ring form after application of the shrunk-on ring 5 at heated condition a constructional lock 6 which secures the position of the shrunk-on ring 5 on the divided ring 4 against shifting and the prestress due to the application of the shrunk-on ring 5 on the divided ring 4 at heated condition fastens the divided ring 4 in the circumferential groove 24 of the shaft 2. Thus the twin inlet runner wheel 1 is secured against axial shifting in both directions.

CLAIMS

1. Fastening of a runner wheel of a pump on a shaft, particularly of a twin-inlet runner wheel provided with a hub of hydraulic shape with two end faces, arranged on a shaft by means of a feather key situated in a longitudinal groove of the shaft, wherein the first end face of the hub of the runner wheel bears against a radial bearing surface of a collar of the shaft, whereas the second end face of the hub of the runner wheel rests against a face of a divided ring arranged in a circumferential groove of the shaft behind the second end face of the hub of the runner wheel, the divided ring in the circumferential groove of the shaft being maintained in position by a shrunk-on ring applied on the external surface of the divided ring at heated condition, the external shape of said ring corresponding to the hydraulic shape of the hub of the runner wheel.

2. Fastening according to Claim 1, wherein the external surface of the divided ring comprises two mutually stepped-up surfaces of different diameters, wherein the first circumferential surface of smaller diameter is close to the hub of the runner wheel and the second circumferential surface of larger diameter is provided on the more distant part of the external surface of the divided ring from the hub of the runner wheel.

3. Fastening according to Claim 1 or 2 wherein the internal opening of the shrunk-on ring consists of two cylindrical parts, the diameter of the first cylindrical part corresponding to the smaller diameter of the first circumferential part of the external surface of the divided ring and the diameter of the second cylindrical part corresponding to the larger diameter of the second circumferential part of the external surface of the divided ring.

4. Fastening according to Claim 1, 2 or 3 wherein cylindrical parts of the internal opening of the shrunk-on ring and circumferential parts of the external surface of the divided ring form after application of the shrunk-on ring, a constructional lock.

5. Fastening according to Claim 1 constructed, arranged and adapted to operate substantially as herein described with reference to, and as shown in the accompanying drawings.

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